

## INTEGRATED QUALITY MANAGEMENT SYSTEM IN A HARD COAL MINE – OPERATION ASSESSMENT

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**Abstract:** The Integrated Management System (IMS) is a well-documented and consistent system enabling effective and simultaneous management of many aspects of a business' operations through defining and realizing a consistent policy. To be able to say that management is rational and thought-out is to point towards a managing object and a managed object. Management is the action causing the managed object to behave in accordance with the managing object's decisions. Therefore, a correctly and effectively functioning object must have precisely defined goals, which it will realise under management. In 2010, the Integrated Management System had been implemented in the largest mining company in Europe – the Polish Mining Group (Polska Grupa Górnicza S.A.) in Katowice. The article presents the perception of IMS by employees in the mine where it was implemented and operates. Survey results (related to IMS) point towards the workers' knowledge (or lack thereof).

**Keywords:** Integrated Management System (IMS), research, survey, audits

### 1. INTRODUCTION

In a market economy, the condition for operational efficiency growth is the common application of economic calculation, enabling a comparison of the achieved effects with the input. Modern entrepreneurs and businesses face challenges in effectively fulfilling ever-changing client needs. This applies to all aspects of a business' operations, as well as the aspects connected to quality (Skrzypek, 2020).

In the 21st century, both the world and the national markets have become more competitive than they were at the end of the previous century. The world crisis has also made its influence, causing increasing difficulty in realizing a business plan. This is why businesses increasingly reach for proven tools, allowing them to implement management systems that are on par with global enterprises (Ahsen and Fuc, 2021). This tool is a management system compliant with the International Organization for Standardization (ISO). Businesses worldwide have introduced the QMS – Quality Management System, which complies with ISO norms and has become synonymous with success and good management.

The base of this system is the ISO 9001 norm, published and containing identical contents in all 160 countries, where national Standardization Committees are responsible for implementing it.



This project's idea is to implement a system thanks to which (regardless of the country's origin or culture) the product will fulfill international norms of the highest standard. Therefore, the business' location or the product's origin is considered irrelevant as long as it contains an ISO 9001 designation, which fulfills both international and client standards. Above all, the recipient has the confidence that the business aims to constantly improve itself and its product.

The effort required to fix the business' operations to ISO 9001 requirements, that is, acquiring an ISO standard, is difficult to quantify, but it is the basis of success. Therefore, after the business acquires such a standard, the fact is appropriately publicized. The work connected with this often begins a couple of dozen months before acquiring said certificate.

The preparatory work requires:

- workshops for personnel,
- communication improvements,
- practical applications of gained knowledge,
- modernization of devices,
- space management,
- analysis and verification of documents,
- changing contracts to be in accordance with the required regulations.

This is one documented and consistent system that enables efficient and simultaneous management of many aspects of businesses' operations by defining and realizing a uniform policy.

To be able to say that management happens in a rational, thought-out way, it is imperative to point towards a managing object and a managed object. Management is the action of making the managed object behave in accordance with the managing object's decisions (Hamrol, 2008, Knosala 2015). Thus, a properly and efficiently functioning object must have precisely defined functions of a goal, which it will realize during the management process.

Managing a business in accordance with modern methods of ISO Management significantly increases the quality of produced products. The quality of product brings several basic benefits, including but not limited to:

- improved reputation,
- lower marketing effort,
- better sales,
- improved productivity,
- long-term profitability,
- lower risk of complaints,
- lower costs.

The benefits of quality management are shown in Fig. 1.

The literature (Kończak, 2007) points towards a division of four basic groups of traits that characterize quality.

These traits include:

1. Technical traits, which include:

- geometric dimensions,
- physicochemical properties,
- parameters characterizing the operation of the product (speed, efficiency, power).

## 2. Usable traits such as:

- reliability,
- service,
- durability,
- availability,
- ergonomics,
- safety of use.

## 3. Aesthetic traits:

- outside appearance,
- color palette,
- proportions,
- compliance with fashion requirements,
- workmanship.

## 4. Economic traits:

- social cost of production,
- exploitation costs.

The basis of the ISO 9001 standard, which a business accepts as standard procedure for building a quality system, are the following four elements:

1. definition of the goals, tasks, and responsibilities,
2. preparation of the appropriate resources,
3. management of the appropriate realization of production to realize the client's expectations,
4. measurement of the processes and their advancement.

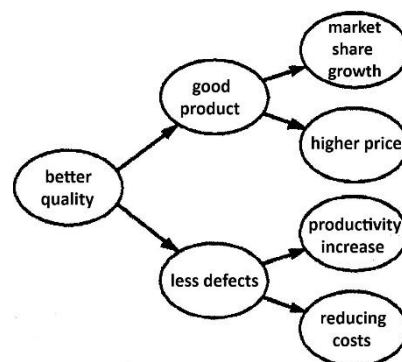


Fig. 1. Benefits of quality management

In sum, standardization certificates (ISO 9001) have been created to protect the customer. The document confirms the manufacturer's declaration of fulfilling the clients' expectations. The certificate is issued by an independent, sovereign certification unit, which issues an opinion and a certificate through a number of controls of both product and management staff quality.

## 2. CHARACTERISTIC OF INTEGRATED MANAGEMENT SYSTEMS (IMS)

The Integrated Management System (IMS) is a conventional concept. In some businesses, IMS is understood as a combination of quality and environmental norms. However, in other businesses, IMS is understood as a combination of Quality, Environmental, and Work Safety Management Systems. According to the newest trends, the three prior are often supplemented by an Information Safety Management System

(Białowas, 2006). These fields used to be seen separately, but as certain systems were implemented, the common traits between certain fields began to be noticed in certain businesses. Thus, the concept of Integrated Management Systems (IMS) was created, connecting the fields with each other. Its implementation enables efficient and simultaneous management of various subsystems through implementing and realizing one uniform policy (Góra, 2021).

An integrated management system is a combination of processes, procedures, and practices implemented in businesses to implement policy. It may be more effective in achieving a certain set of policy goals than an approach through separate systems.

International Quality Associations (IQA) defines the Integrated Management System (IMS) as follows:

Integrated management is the understanding and effective management of every aspect of an organization's operations in such a way that the needs and expectations of stakeholders are equitably and satisfactorily met through the use of all resources.

Implementing an integrated management system is the most recommended and efficient solution for any business that intends to introduce several different management systems. Depending on the specifics of the industry and the plans that the business wishes to realize in a given time period, the appropriate management system consisting of different subsystems is introduced. Usually, the basis of most such projects is the Quality Management System (QMS) in accordance with PN-EN ISO 9001:2015 norms (PN, 2025). Most often, the integration concerns two or three chosen systems. Many businesses integrate their Quality Management Systems (QMS) with Environmental Management Systems PN-EN ISO 14001:2015 (PN, 2015), Work Safety Management Systems PN-EN ISO 45001:2024 (PN, 2024), Information Safety Management Systems PN-EN ISO 27001:2023, or with sector systems (PN-EN ISO 22000:2018, HACCP, GMP+, GMP, GHP), AQAP requirements etc.

The implemented and certified Integrated Management System (IMS) contributes to (Rączka, 2015, Scheiber, 2016):

- more harmonious and dynamic business growth,
- cost minimization and optimization connected to the implementation and upkeep of said system – the opportunity to certify and oversee said system, thus increasing the profits and profitability,
- better organization of work, clear definition of tasks, competencies, and responsibilities of employees and their readiness to meet customer requirements,
- organizing and eliminating duplicate activities in all sectors of the business, reducing internal inconsistencies,
- effective management of resources,
- unification and decrease in the amount of documentation needed – a clear and logical connection between both procedures and processes referencing different systems,
- increased elasticity of implementing change,
- improving management and activities and creating a basis for the possible introduction of the idea of TQM (Total Quality Management) in the enterprise,
- facilitating compliance with legal requirements and ensuring quick adaptation of internal regulations to changes taking place in the applicable legal system,
- strengthening the businesses' market standing, especially in the European Union,
- positively shaping the business' image in the eyes of customers, contractors, and community, as well as the supervising entities of the state,

- increased prestige and customer trust.

As a result of combining different actions into one Integrated System, we achieve quantifiable benefits as a result of reducing expenditure on implementation and supervision of systems. This is connected with the realization of different goals in an integrated matter, as a result of which we achieve a synergy effect. As a result of implementing the Integrated System, we achieve very specific benefits, which we can measure with the help of various indicators. We also gain a series of non-quantifiable benefits, which we are not able to quantify with the help of numbers of indicators (either that, or it is extremely difficult to do so).

The decision to integrate system management should be the strategic decision of the business. Thus, the goals, expectations, results and costs of the undertaking should be defined before the one decides to implement them.

In 2010, in the largest mining enterprise in Europe – the Polish Mining Group – Polska Grupa Górnicza S.A. – (formerly the Coal Company – Kompania Węglowa S.A.) in Katowice, an Integrated Management System (IMS) had been implemented.

### **3. THE INTEGRATED MANAGEMENT SYSTEM IN MINES BELONGING TO THE POLISH MINING GROUP (PGG S.A.)**

The implementation of an Integrated Management System (IMS) in a mine enables one to define and systemize the directions of operations and mine growth both in terms of the products supplied as well as the environmental impact. It also has the added task of perfecting the internal relations of the company, introducing a better culture of organization, improving the efficiency of work and rationalizing costs.

The precedent goal of the Integrated Management System (IMS) in a mine is the client satisfaction with the quality of the acquired product, as well as consideration of the environment and work safety. In the case of mines (as well as other cases), the quality of the product has a direct influence on the product's price, accumulating in the financial results of the mine. From the identified environmental aspects stem appropriate environmental programs, and the results of qualitative and customer satisfaction research define the further market operations towards the given goal.

The system implemented in the mine must have a qualitative policy defined by the mine management.

The following should stem from the qualitative policy:

- the goal of the organization,
- commitment to fulfilling the customer's expectations,
- method of auditing and reviewing,
- internal and external communications.

The functioning quality management system should define a method of conducting system reviews in terms of suitability for the conditions of a deep mine.

The implementation of new organizational-technical solutions (including but not limited to a quality management system) must be economically justified. Therefore, one cannot absolutely submit to the client's expectations – one should submit within economically justifiable limits.

Theoretically, it could be said that the management of a mine, knowing the quality of the seams shared and prepared to be exploited, chooses the exploitation of the seam in accordance with the client's expectations and orders of quality. In practice, the mine

exploits the seams it has planned to exploit in accordance with the common rules of mining and work safety.

The factors which the mine can influence include, but are not limited to:

- acquiring product of a given grain size in order to acquire a given assortment of coal,
- acquiring the parameters of enriched coal,
- acquiring coal of a given humidity.

These processes stem mostly from the technology applied in coal processing. The quality of coal in the seam has a large influence on how the final product is acquired. Certain elements of the production process may also be influenced by the miners themselves. These elements include, but are not limited to the quality of the coal coming from a mine, where the main problem is accumulation of water, the cleanliness of the seam (deposit), as well as any exogenous contamination.

On the basis of observations conducted in businesses that implemented IMS one can conclude that the Quality Management System organizes the entirety of the documentation and procedural realm, which may (but is not required to) influence the final product. Among the benefits brought, internal and external may be distinguished (Rajkiewicz and Mikulski, 2016).

External benefits include:

- organization, systemization, and transparency of processes,
- early recognition of faults, weak links, and imperfections,
- improvement of the flow of information, which is necessary for quick and accurate decision-making,
- clear division of responsibilities and competencies,
- provision of timely and consistent deliveries,
- application of the organizational system to an improved mine organization system,
- reducing the costs of poor quality products and locating the sources of said products, reducing the number of mistakes made.

Internal benefits include:

- good perception of the product's quality by customers,
- good standing among competitors,
- marketing benefits,
- reducing the number of warranty complaints,
- fulfilling the client's expectations,
- international recognition of the system and the related more favorable terms of contracts and negotiations.

The main benefits of a quality management system include, but are not limited to:

1. clients acquiring a product consistent with their expectations,
2. suppliers benefiting from the partnership and mutual understanding,
3. a general benefit to society, thanks to the fulfillment of policies and requirements, improvement of health and safety at work, as well the limiting of negative effects on the environment,
4. improving work conditions.

Having described the above, the Polish Mining Group (PGG S.A.) in Katowice introduced an Integrated Management System (IMS) in 2010.

The first system that had been implemented in the Polish Mining Group (PGG S.A.) (formerly the Coal Company Kompania Węglowa S.A.) was the Quality Management System. The confirmation of effective implementation of this system was the certificate

issued on the 24<sup>th</sup> of November 2004 by the certifying company SGC United Kingdom Ltd. Over the next years, the system had been recertified in accordance with the norm's requirements, therefore confirming the fulfillment of the requirements making up ISO 9001, including planning, exploitation, processing, and sale of coal, mining services, renovations, modernizations, and production of mining machines, as well as the upkeep and development of information and telecommunication systems.

The second system, implemented in 2007 by the Polish Mining Group (PGG S.A.), in accordance with the ISO 14001 norm, was the Environmental Management System. The norm includes system requirements, taking into account legal requirements, information of significant impact on the environment, as well as defining the guidelines of supervising operations with an influence on the environment. The goal of implementing such a system in the Polish Mining Group (PGG S.A.) was to:

- increase worker's awareness of their impact on the environment,
- comply with the then-applicable legal requirements,
- reduce costs related to the usage of the natural environment and waste management,
- minimize the possibility of emergency situations and accidents in companies through an earlier identification of potential risks and introduction of solutions preventing such risks,
- improve relations with environmental protection services, as well as to improve public opinion.

At the turn of October and November of 2010, another audit recertifying and reassessing the compliance of procedures with the given standard was conducted, which confirmed the fulfillment of ISO 14001 norms including planning, exploitation, processing, and sale of coal, mining services, renovations, modernizations, and production of mining machines, as well as the upkeep and development of information and telecommunication systems.

In 2008, the management of the Polish Mining Group (PGG S.A.) decided to begin linking the Integrated Management System (IMS), which was based upon norms of the Quality and Environment Management System, with the Work Safety Management System. In order to implement the three systems, a consulting firm's advice was used. The process of linking the two consisted of expanding the Integrated Management System (IMS) by elements required by the then-norm PN-N-18001 with special consideration of the unification of work risk assessment cards.

Having conducted an assessment audit, the compliance of the system with the given standard, on the 3<sup>rd</sup> of December 2010, the Polish Mining Group (PGG S.A.) had been given a certificate confirming the fulfillment of requirements included in norm PN-N-18001.

The above-mentioned audit included the following:

- planning,
- exploitation,
- processing and sale of coal,
- mining services,
- renovations,
- modernizations and production of mining machines,
- upkeep and development of information and telecommunication systems.

The certification had been given out by the certifying company Polish Chamber of International Trade (Polska Izba Handlu Zagranicznego), which is accredited by the PCA – Polish Accreditation Center (Polskie Centrum Akredytacji).

Since this event, the mine implements an quality, environment, and safety Integrated Management System (IMS), which periodically undergoes recertification.

The goals towards which the Polish Mining Group (PGG S.A.) strived in their efforts to implement the Integrated Management System (IMS) were:

- correct planning of the identified processes, as well as the resources necessary to realize the given goal (in this case, resources are understood as planning the issue, managing the infrastructure, purchasing, and managing human resources),
- ensuring, in a documented manner, that the quality requirements of the product are fulfilled in the given processes, with simultaneous fulfillment of environmental protection and work safety requirements,
- the earliest possible recognition and removal of effects and reasons causing disturbances in realized processes thanks to implementations of correctional and preventative operations,
- measurements and analyses, as well as perfecting the effectiveness of operations in order to ensure quality in the undertaken processes,
- restricting the negative impact on the environment,
- improvement on the state of security and work safety.

The implementation of Integrated Management Systems (IMS) ensures, in a documented manner, that the quality requirements concerning the product in given processes are fulfilled during all stages of the production process, with simultaneous fulfillment of environmental protection and work safety requirements through:

- minimizing the risk of mistakes in the offered product,
- the earliest possible recognition and removal of effects and reasons causing disturbances in realized environmental protection and work safety processes,
- implementation of correctional and preventative measures, conducting measurements and analyses,
- perfecting the efficiency of operations in order to ensure quality in the undertaken processes
- limiting negative influences on the environment, and improving work safety and hygiene.

The goals of the Integrated Management System (IMS) of the Polish Mining Group (PGG S.A.) result from the given and communicated policy of IMS, identified environmental aspects and work safety goals, including defining aspects, identified risks, and current needs of the Owner, which is the State Treasury.

The goals for certain processes are defined in the Book of Processes and Technical-Economic Plan, as well as the Movement Plan appropriate for the given mining plant (mine).

Strategic goals for the Polish Mining Group (PGG S.A.), including the subjects making up said group, are established in business and strategic plans.

Policy of Management Systems reflects the main goals of the Polish Mining Group's (PGG S.A.) – and is available on the Polish Mining Group's (PGG S.A.) website. It is available not only for workers but also for all potential clients ([www.kwsa.pl](http://www.kwsa.pl)7).

#### **4. CHARACTERICS OF THE MINE**

The research was conducted in 2020 on one of the mines belonging to the Polish Mining Group (PGG S.A.) in Katowice. The deposits belonging to the mining area are Załęskie, Ruda, Siodłowe, and Porębskie. The mining area of the mine is 40,4 km<sup>2</sup>. The incline of



the Carboniferous layers is variable and ranges from several degrees at the bottom of the basin to 30-35 degrees in the eastern part and 20-25 degrees in the western part. Currently, the mine has one mining level – mining also takes place sub-level.

The mine exploits type 32 energetic coals with an average caloric value of 23500 kJ/kg, an average ash content of 16%, and an average sulfur content of 0,8%.

Natural hazards occurring in the mine are:

- methane: seams in the I, II, and III categories of methane hazards,
- ash: class B,
- self-ignition tendency: III, IV class
- water hazard: I and III degree
- rockfall: does not occur.

## 5. ASSESSMENT OF FUNCTIONING IMS IN THE MINE

The assessment of the Integrated Management System's (IMS) functioning in the mine has been conducted on the basis of the following data:

- results from the survey conducted amongst workers,
- analysis of the reports from internal audits.

### 5.1. Survey research

Survey research (Chudzik, 2010) has been conducted among a group of 90 workers. The survey participants had been chosen from amongst the crew in a random manner. The survey had been delivered to the training department of the mine, where it had been fulfilled by workers. Among the 90 people in the group, 50 had been working on the surface, whereas 40 had been working underground.

The goal of the survey was to obtain answers to many questions connected to the Integrated Management System (IMS), in particular whether:

- mine workers are aware of the existence of the Integrated Management System (IMS) in their workplace,
- act in accordance with the rules of the system,
- are aware of the usefulness of the Integrated Management System (IMS).

A characteristic of the survey participants broken down by work area has been shown in Table 1.

Table 1  
Characteristics of the respondents

| Division criteria | Specification        | Number of respondents |                 | Number of respondents in % |                 |
|-------------------|----------------------|-----------------------|-----------------|----------------------------|-----------------|
|                   |                      | underground workers   | surface workers | underground workers        | surface workers |
| Gender            | Woman                | 0                     | 28              | 0                          | 56              |
|                   | Man                  | 40                    | 22              | 100                        | 44              |
| Age               | < 25 years           | 9                     | 14              | 22                         | 28              |
|                   | 25-40 years          | 15                    | 10              | 38                         | 20              |
|                   | 41-50 years          | 14                    | 14              | 35                         | 28              |
|                   | > 50 years           | 2                     | 12              | 5                          | 24              |
| Education         | Basic education      | 1                     | 0               | 3                          | 0               |
|                   | Vocational education | 25                    | 38              | 62                         | 76              |
|                   | Secondary education  | 14                    | 12              | 35                         | 24              |

|                                |                                         |    |    |    |    |
|--------------------------------|-----------------------------------------|----|----|----|----|
|                                | Higher education, related to mining     | 0  | 0  | 0  | 0  |
|                                | Higher education, not related to mining | 0  | 0  | 0  | 0  |
| <b>Total length of service</b> | < 5 years                               | 13 | 16 | 33 | 32 |
|                                | 6-10 years                              | 2  | 0  | 4  | 0  |
|                                | 11-15 years                             | 0  | 0  | 0  | 0  |
|                                | 16-20 years                             | 12 | 8  | 30 | 16 |
|                                | > 21 years                              | 13 | 26 | 33 | 52 |
| <b>Position held</b>           | Working class underground               | 38 | 44 | 95 | 88 |
|                                | Workers on the surface                  | 0  | 0  | 0  | 0  |
|                                | Non-working class underground           | 2  | 0  | 5  | 0  |
|                                | Non-working-class at the surface        | 0  | 6  | 0  | 12 |

Having analyzed the data in Table 1, one can conclude that the distribution among the surveyed mine workers is as follows:

- The most numerous group of underground workers are workers between the age of 25-50 years, and the least numerous group are workers above the age of 50. However, the age distribution among surface workers is comparable.
- Both among the surface and underground workers vocational education is predominant. The next largest group is those with secondary education.
- Work experience among underground workers is distributed equally among groups of < 5 years, 16-20 years, and > 21 years. A similar distribution is observed among workers on the surface.

## 5.2. Analysis of the survey results (chosen questions)

Analysis of survey results was conducted for questions that point towards knowledge (or its lack) among workers of the Integrated Management System (IMS), which had been implemented and which functions in the mine.

The defining question concerned the implementation of the Integrated Management System (IMS) – whether the fact occurred in the workers' consciences. The answers of the surface workers, as well as the underground workers, were close in their natures – the vast majority is aware of the IMS' function in the mine (Fig. 2, 3). However, the following fact is of concern – 20% of underground workers strongly believe that the IMS had not been introduced in the mine, however 2% answered, "I do not know."

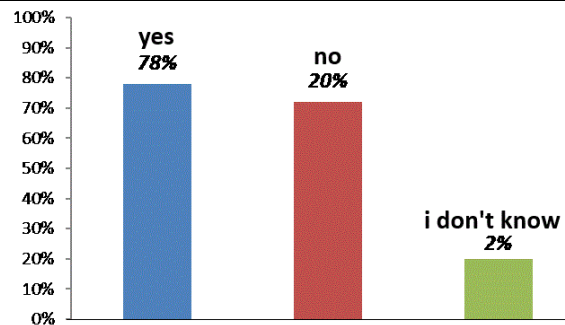


Fig. 2. Knowledge of IMS implementation – underground workers

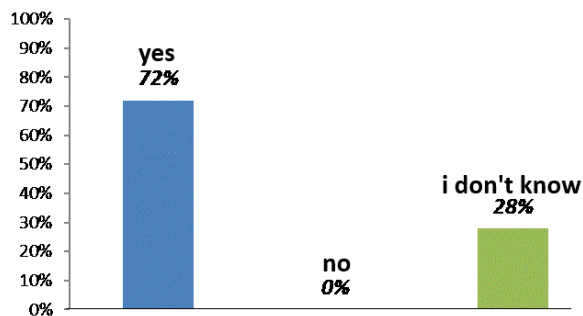


Fig. 3. Knowledge of IMS implementation – surface workers

Amongst surface workers, there are no “No” answers, however the percentage of “I do not know” answers is high as well – 28%. The above answers prove the insufficient flow of information between management and workers.

The next question concerned the components of the Integrated Management System (IMS). The distribution of answers of certain respondent groups has been shown in Figures 4 and 5.

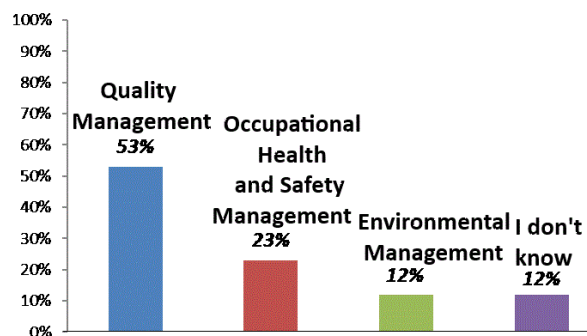


Fig. 4. The components of the Integrated Management System (IMS) – underground workers

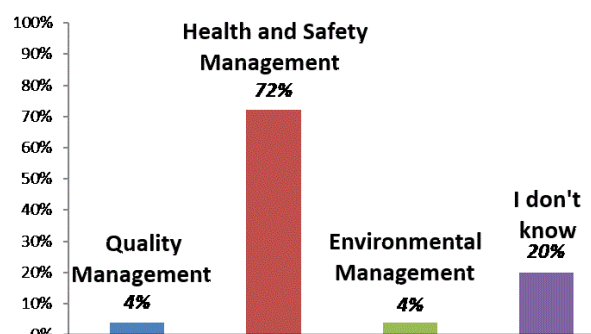


Fig. 5. Components of the Integrated Management System (IMS) – surface workers

The distribution of answers to the question had been significant enough both in the group of underground and surface workers. For underground workers, the Integrated Management System (IMS) is understood mainly as Quality Management, whereas for surface workers, it is understood mainly as Work Safety and Hygiene Management. Amongst all survey respondents, only 7 people had chosen the correct answers, defining all systems as components of the Integrated Management System (IMS). Amongst these 7 survey respondents, there were 5 underground workers and 2 surface workers. This confirms the insufficient information flow between management and workers. underground workers have greater knowledge, among which 12% had chosen the correct answers, choosing all three elements of IMS.

The following question was connected to the benefits for the mine in accordance with the implementation of the Integrated Management System (IMS). The answers had been presented in Figures 6 and 7.

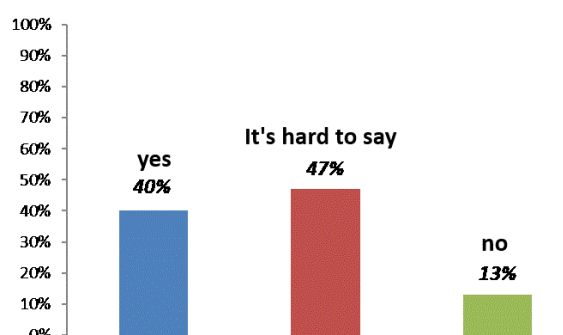


Fig. 6. Noticing the benefits coming from the functioning of IMS – underground workers

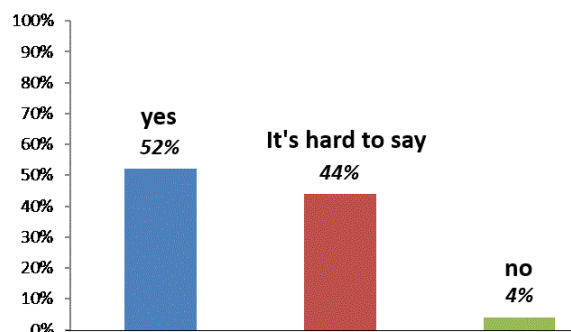


Fig. 7. Noticing the benefits coming from the functioning of IMS – surface workers

The vast majority (52%) of surface workers had chosen affirmative answers to this question; however, among underground workers, only 40% did so. The “Hard to answer” responses were close, as among underground workers, it was equal to 47%, considerably close to the surface workers’ 44%. However, the “No” answers were most significant among surface workers – 13%, as compared to 4% of underground workers.

A diverse array of answers among respondents can be observed in case of the question concerning the fulfillment of the Integrated Management System (IMS)’s function. The results shown in Figure 8 and 9. Among the group of underground workers the vast majority (63%) cannot definitely answer the given question. Only a little over a third answered affirmatively (35%), however only 2% answered “No”.

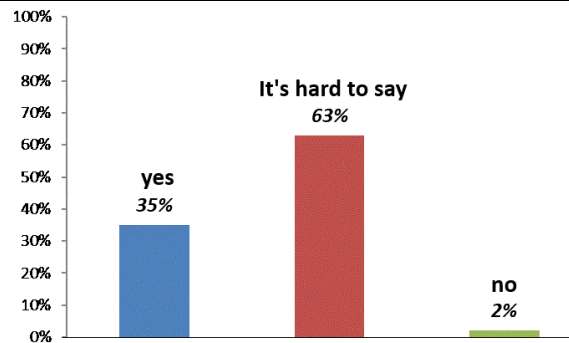


Fig. 8. Fulfillment of function by IMS – underground workers

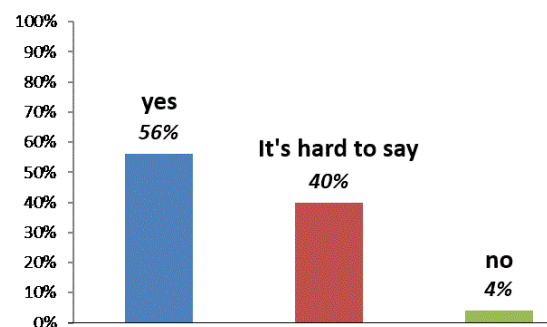


Fig. 9. Fulfillment of function by IMS – surface workers

In the case of surface workers, the answers present themselves as follows:

- 56% answered the affirmative,
- 40% do not have an opinion on the topic,
- 4% answered the negative.

Another one of the questions concerned the internal audits. The survey results suggest that a significant amount of survey respondents answered affirmatively. Among underground workers, 70% answered affirmatively. However, among surface workers the percentage of affirmative answers was equal to 60%.

'No' answers were very close, where they were equal to:

- 5% among underground workers,
- 4% among surface workers.

The results for both groups of workers are illustrated in Figures 10 and 11.

Answers to the remaining questions, which had been asked in the survey, had been presented in the form of tables, with division into underground and surface workers.

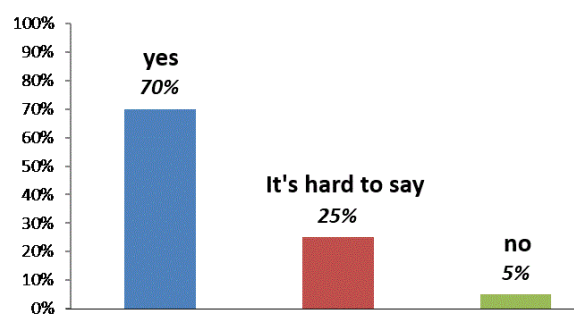


Fig. 10. Internal audits – underground workers

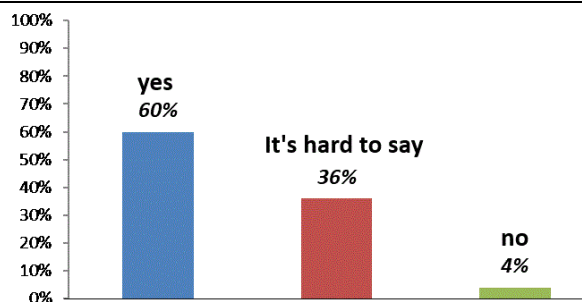


Fig. 11. Internal audits – surface workers

The workers had been asked the following questions:

- who is responsible for the quality in the mine – Table 2,

Table 2

Responsibility for quality

| Possible answers                                                                            | Employee responses  |                 | Employee responses in % |                 |
|---------------------------------------------------------------------------------------------|---------------------|-----------------|-------------------------|-----------------|
|                                                                                             | underground workers | surface workers | underground workers     | surface workers |
| Management board, supervision                                                               | 14                  | 22              | 35                      | 44              |
| Every employee                                                                              | 21                  | 12              | 53                      | 24              |
| It has no impact on quality, because it is at the same level regardless of external factors | 5                   | 12              | 12                      | 24              |
| No answer                                                                                   | 0                   | 4               | 0                       | 8               |

- whether an ISO 14001:2015 certificate significantly reduces the negative impact on the environment – Table 3,

Table 3

Having a certificate and its impact on the natural environment

| Possible answers               | Employee responses  |                 | Employee responses in % |                 |
|--------------------------------|---------------------|-----------------|-------------------------|-----------------|
|                                | underground workers | surface workers | underground workers     | surface workers |
| Yes                            | 14                  | 14              | 35                      | 28              |
| No, it doesn't change anything | 8                   | 8               | 20                      | 16              |
| It's hard to say               | 17                  | 26              | 43                      | 52              |
| No answer                      | 1                   | 2               | 2                       | 4               |

- whether an ISO 140001:2015 certificate causes an increase in worker awareness concerning the environmental impact – Table 4,

Table 4

Having a certificate and increasing awareness among employees

| Possible answers | Employee responses  |                 | Employee responses in % |                 |
|------------------|---------------------|-----------------|-------------------------|-----------------|
|                  | underground workers | surface workers | underground workers     | surface workers |
| Tak              | 8                   | 32              | 20                      | 64              |
| Yes              | 9                   | 0               | 23                      | 0               |

|                                |    |    |    |    |
|--------------------------------|----|----|----|----|
| No, it doesn't change anything | 22 | 14 | 55 | 28 |
| It's hard to say               | 1  | 4  | 2  | 8  |
| No answer                      |    |    |    |    |

- whether the documents concerning IMS and ISO norms are available – Table 5,

Table 5

Access to Integrated Management System documents

| Possible answers | Employee responses  |                 | Employee responses in % |                 |
|------------------|---------------------|-----------------|-------------------------|-----------------|
|                  | underground workers | surface workers | underground workers     | surface workers |
| Yes              | 11                  | 30              | 28                      | 60              |
| No               | 26                  | 20              | 65                      | 40              |
| No answer        | 3                   | 0               | 7                       | 0               |

- whether IMS significantly improves the functioning of the workplace – Table 6,

Table 6

The impact of the Integrated Management System on workplace improvement

| Possible answers | Employee responses  |                 | Employee responses in % |                 |
|------------------|---------------------|-----------------|-------------------------|-----------------|
|                  | underground workers | surface workers | underground workers     | surface workers |
| Definitely yes   | 3                   | 6               | 8                       | 12              |
| I guess so       | 19                  | 29              | 47                      | 58              |
| Definitely no    | 1                   | 2               | 2                       | 4               |
| I don't think so | 14                  | 8               | 35                      | 16              |
| No answer        | 3                   | 5               | 8                       | 10              |

- whether differences in the mine's functioning before and after the implementation of IMS – Table 7,

Table 7

Differences in the functioning of the mine before and after the introduction of the IMS

| Possible answers                                                                            | Employee responses  |                 | Employee responses in % |                     |
|---------------------------------------------------------------------------------------------|---------------------|-----------------|-------------------------|---------------------|
|                                                                                             | underground workers | surface workers | staff bottom            | underground workers |
| Yes, there are differences that make work easier and improve quality                        | 5                   | 13              | 12                      | 20                  |
| Yes, there are differences, but they have made work more difficult due to more requirements | 16                  | 14              | 40                      | 33                  |
| No, there are no differences, the work looks the same as before                             | 16                  | 20              | 40                      | 40                  |
| No answer                                                                                   | 3                   | 3               | 8                       | 7                   |

- whether periodically conducted audits perfect the operation of IMS – Table 8.

Table 8

Improving the activities of the IMS through periodic audits

| Possible answers       | Employee responses  |                 | Employee responses in % |                     |
|------------------------|---------------------|-----------------|-------------------------|---------------------|
|                        | underground workers | surface workers | staff bottom            | underground workers |
| Yes                    | 21                  | 38              | 53                      | 76                  |
| No                     | 7                   | 8               | 17                      | 16                  |
| They have no influence | 12                  | 4               | 30                      | 8                   |

## 6. SUMMARY

The results of the survey conducted among mine workers suggest that they are aware of the existence of IMS in the mine, however they remain unaware of its components, of its functions, or who is responsible for the system.

They do not notice the benefits of the implemented system or the improvements in their workplace.

In order to increase IMS awareness among the work crew, its operations and benefits (both for underground and surface workers), constant training exercises must be conducted.

During these training exercises, workers must be made aware of the fact that the mine is a modern company, offering products that the customer expects, with simultaneous respect of the natural environment by fulfilling all expectations in this regard. One must bring attention to the minimized environmental impact, as well as pointing attention towards areas in which the customer is exposed to said impact.

A lack of satisfaction among workers is noticeable in areas of Work Safety and Hygiene. There is a significant lack of a decisive reaction in underground situations, as well as a lack of an effective worker control method. The mine should make an effort towards punctuality and quality of control operations conducted by the appropriately authorized organizational units of the mine.

The results were based on a survey conducted amongst mine workers. There are no grounds to suspect the survey had been conducted dishonestly – it is a moral and ethical problem which can be applied to many areas of life (Maruszewska, 2010).

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